

Attorney Docket: 225/48167CO  
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: RAINER GADOW ET AL.

Serial No.: NOT YET ASSIGNED Group Art Unit:

Filed: AUGUST 23, 2001 Examiner:

Title: FIBER-REINFORCED COMPOSITE CERAMICS INFILTRATED  
WITH MOLTEN METAL

**PRELIMINARY AMENDMENT**

Commissioner for Patents  
Washington, D.C. 20231

Sir:

Please amend the above-identified application as follows:

**IN THE SPECIFICATION:**

Please amend the specification as follows:

Page 1 (Amended Sheet), before first line of text, insert  
--**BACKGROUND OF THE INVENTION**--.

Page 3 (Amended Sheet), before line 20, insert --**SUMMARY  
OF THE INVENTION**--

Page 11, line 27, change "In the drawing:" to --**BRIEF  
DESCRIPTION OF THE DRAWINGS**--; and  
before line 26, insert --**DETAILED DESCRIPTION  
OF THE INVENTION**--.

Page 18, line 1, change "Claims" to --**WHAT IS CLAIMED  
IS**--.

**IN THE CLAIMS:**

Please cancel Claims 1-35, without prejudice to or disclaimer of the subject matter therein.

Please add new Claims 36-82 as follows:

36. (NEW) A melt-infiltrated fibre-reinforced composite ceramic comprising high-temperature-resistant fibers reaction-bonded to a matrix comprising an alloy of silicon and iron.

37. (NEW) The melt-infiltrated fibre-reinforced composite ceramic of Claim 36, wherein the high-temperature-resistant fibers comprise at least one of Si, C, B, or N.

38. (NEW) The composite ceramic of Claim 36, wherein the matrix further comprises at least one element selected from the group consisting of chromium, titanium, aluminum, nickel and molybdenum as passive layer formers.

39. (NEW) The composite ceramic of Claim 36, wherein the matrix contains from 0.5 to 80% by weight of iron.

40. (NEW) The composite ceramic of Claim 39, wherein the matrix contains from 5 to 50% by weight of iron.

41. (NEW) The composite ceramic of Claim 38, wherein the silicon alloy contains from 0.03 to 40% by weight of chromium.

42. (NEW) The composite ceramic of Claim 41, wherein the matrix contains from 1 to 40% by weight of chromium.

43. (NEW) The composite ceramic of Claim 42, wherein the matrix contains from 1 to 10% by weight of chromium.

44. (NEW) The composite ceramic of Claim 36, wherein the fibers are C fibers or SiC fibers.

45. (NEW) The composite ceramic of Claim 36, wherein the fibers are collected together to form fibre bundles and are surface-impregnated with pitch.

46. (NEW) The composite ceramic of Claim 45, wherein the fibers bundles are short-fibre bundles.

47. (NEW) The composite ceramic of Claim 46, wherein the fibers comprise C filaments having mean diameters of from about 5 to 12  $\mu\text{m}$  and a length of from about 2 to 10 mm and the fibre bundles contain from about 3000 to 14,000 filaments.

48. (NEW) A process for producing a fibre-reinforced composite ceramic comprising high-temperature-resistant fibers reaction-bonded to a matrix, comprising the following steps:  
producing a green body from fibers, binders and fillers by at least one step selected from the group consisting of winding, lamination, pressing, and hot flow molding;  
pyrolysing the green body under reduced pressure or protective gas in a temperature range from about 800°C to 1200°C to produce a porous shaped body; and  
infiltrating the porous shaped body with a silicon melt which comprises silicon and iron.

49. (New) The process of Claim 48, wherein the high-temperature-resistant fibers comprise at least one of Si, C, B, or N.

50. (NEW) The process of Claim 48, wherein the silicon melt further comprises chromium, titanium, aluminum, nickel or molybdenum or a combination of chromium with titanium, aluminum, nickel or molybdenum as passive layer formers.

51. (NEW) The process of Claim 48, wherein the silicon melt contains from 0.5 to 80% by weight of iron.

52. (NEW) The process of Claim 50, wherein the silicon melt contains from 0.5 to 80% by weight of iron.

53. (NEW) The process of Claim 51, wherein the silicon melt contains from 5 to 50% by weight of iron.

54. (NEW) The process of Claim 52, wherein the silicon melt contains from 5 to 50% by weight of iron.

55. (NEW) The process of Claim 54, wherein the silicon melt contains from 0.03 to 40% by weight of chromium.

56. (NEW) The process of Claim 55, wherein the silicon melt contains from 1 to 40% by weight of chromium.

57. (NEW) The process of Claim 56, wherein the silicon melt contains from 1 to 10% by weight of chromium.

58. (NEW) The process according of Claim 51, wherein the fibers used are C fibers or SiC fibers.

59. (NEW) The process of Claim 51, wherein the fibers are collected together to form fibre bundles and are surface-impregnated with pitch.

60. (NEW) The process of Claim 59, wherein the fibers bundles are short-fibre bundles.

61. (NEW) The process of Claim 60, wherein the fibre bundles used are formed by from about 3000 to 14,000 C filaments having mean diameters of from about 5 to 10  $\mu$ m and a length of from about 2 to 10 mm.

62. (NEW) The process of Claim 60, wherein the green body is produced by:

forming a granulated material from the fibers, binders, and fillers and;

dry pressing or hot flow molding of the granulated material.

63. (NEW) The process of Claim 61, wherein the green body is produced by:

forming a granulated material from the fibers, binders, and fillers and;

dry pressing or hot flow molding of the granulated material.

64. (NEW) The process of Claim 62, wherein the granulated material is produced by pan granulation.

65. (NEW) The process of Claim 63, wherein the granulated material is produced by pan granulation.

66. (NEW) The process of Claim 64, in which the granulated material is produced continuously or batchwise and has a mean particle size of from about 2 to 6 mm.

67. (NEW) The process of Claim 65, in which the granulated material is produced continuously or batchwise and has a mean particle size of from about 2 to 6 mm.

68. (NEW) The process of Claim 48, wherein carbon-containing fillers are added in the production of green body.

69. (NEW) The process of Claim 68, wherein the carbon-containing fillers comprise carbon black or graphite.

70. (NEW) The process of Claim 48, wherein the fillers in the form of silicides are added in the production of the green body.

71. (NEW) The process of Claim 64, wherein a dry mixture of short-fibre bundles and fillers is first premixed and is subsequently mixed with binders in a pelletizing pan to produce the granulated material.

72. (NEW) The process of Claim 65, wherein a dry mixture of short-fibre bundles and fillers is first premixed and is subsequently mixed with binders in a pelletizing pan to produce the granulated material.

73. (NEW) The process of Claim 69, wherein the granulated material is produced from about 20-60% by weight of SiC powder, about 2-20% by weight of carbon in the form of graphite powder or carbon black, about 10-40% by weight of C

fibre bundles (12K bundles) and about 15-40% by weight of a binder solution, with the latter being sprayed into a pelletizing pan.

74. (NEW) The process of Claim 72, wherein the granulated material is produced from about 20-60% by weight of SiC powder, about 2-20% by weight of carbon in the form of graphite powder or carbon black, about 10-40% by weight of C fibre bundles (12K bundles) and about 15-40% by weight of a binder solution, with the latter being sprayed into a pelletizing pan.

75. (NEW) The process of Claim 73, wherein the binder solution is an aqueous binder solution containing from 0.01 to 10% by weight of methylcellulose esters and polyvinyl alcohol.

76. (NEW) The process of Claim 74, wherein the binder solution is an aqueous binder solution containing from 0.01 to 10% by weight of methylcellulose esters and polyvinyl alcohol.

77. (NEW) The process of Claim 64, wherein the granulated material is dried after it has been produced and is subsequently pressed to form the green body.

78. (NEW) The process of Claim 65, wherein the granulated material is dried after it has been produced and is subsequently pressed to form the green body.

79. (NEW) The process of Claim 48, wherein the green body is heated to from about 950 to 1050°C under a nitrogen atmosphere in a pyrolysis furnace to produce the porous shaped body.

80. (NEW) The process of Claim 48, wherein the green body is converted in the pyrolysis into a shaped body having a porosity of from about 30 to 50%.

81. (NEW) The process of Claim 48, wherein the porous shaped body is infiltrated with a silicon melt containing from about 10 to 50% by weight of iron with the balance being silicon.

82. (NEW) The process of Claim 50, wherein the porous shaped body is infiltrated with a silicon melt containing from about 10 to 50% by weight of iron, from 0.5 to 10% by weight of chromium and silicon as the balance.

#### REMARKS

Claims 36-82 are pending herein. By this Amendment, Claims 1-35 are canceled, and new Claims 36-82 are pending herein.

In the parent application, Claims 36, 38, and 38 [sic: 48] were rejected under 35 U.S.C. 102(e) over U. S. Patent No. 6,193,928 (Rauscher).

Rauscher discloses a process for manufacturing ceramic metal composite bodies. The process is based on molten infiltration and the simultaneous or delayed exchange reaction of ceramic or metal ceramic unfired bodies or sintered bodies, which may consist of nitrides or carbides as well as metals, with molten metal, whereby new nitride, carbide and intermetallic phases are formed (Abstract).

The ceramic metal composite bodies are formed by (1) producing a reaction mass comprising from 40-95 volume % ceramics and from 5-60 volume % of at least two high-



temperature melting metals; and (2) heating the reaction mass under inert conditions to a temperature which permits the formation of a molten phase. The metals in the reaction mass are in the form of metal alloy and may contain at least two of silicon, tin, titanium, zirconium, aluminum, boron, indium, and iron (col. 3, lines 1-22).

The only example of Rauscher discloses using a titanium and silicon alloy. Rauscher does not disclose a matrix comprising an alloy of silicon and iron. Because Rauscher does not disclose each and every element of the claimed invention, Claims 36, 38, and 48 are not anticipated.

In the parent application, Claims 36-82 were rejected under 35 U.S.C. 103(a) over Rauscher.

Under 35 U.S.C. 103(c), a patent which qualifies as prior art under 102(e) does not preclude patentability where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Rauscher and the present application were, at the time the instantly claimed invention was made, both subject to an obligation of assignment to Daimler-Benz AG (DaimlerChrysler AG). Thus, Rauscher is not a prior art reference under 35 U.S.C. 103(c).

If there are any questions regarding this Amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

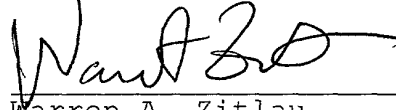
If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any

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deficiency in fees or credit any overpayments to Deposit  
Account No. 05-1323 (Docket #225/48167C0).

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Respectfully submitted,



Warren A. Zitlau

Registration No. 39,085

Donald D. Evenson

Registration No. 26,160

DDE:WAZ:vca

CROWELL & MORING, LLP

P.O. Box 14300

Washington, DC 20044-4300

Telephone No.: (202) 628-8800

Facsimile No.: (202) 628-8844